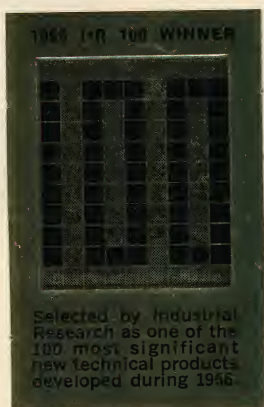
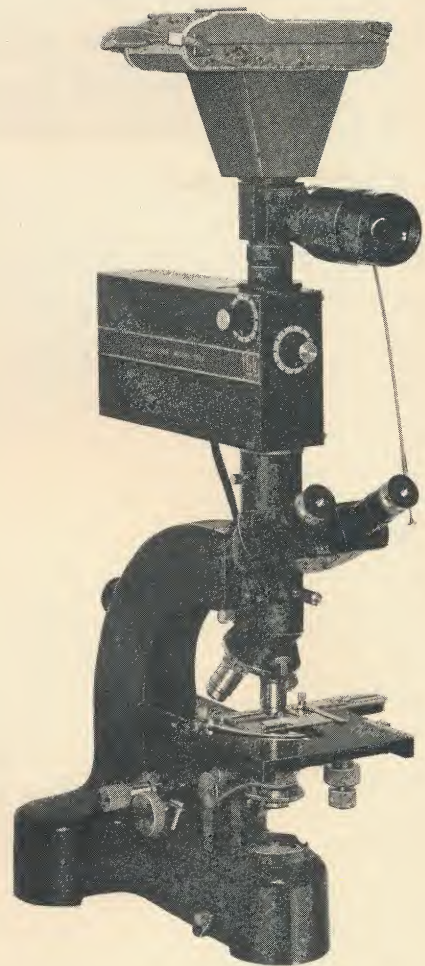


*model 513
biolaser system*



CONTROL DATA
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LASER PRODUCTS

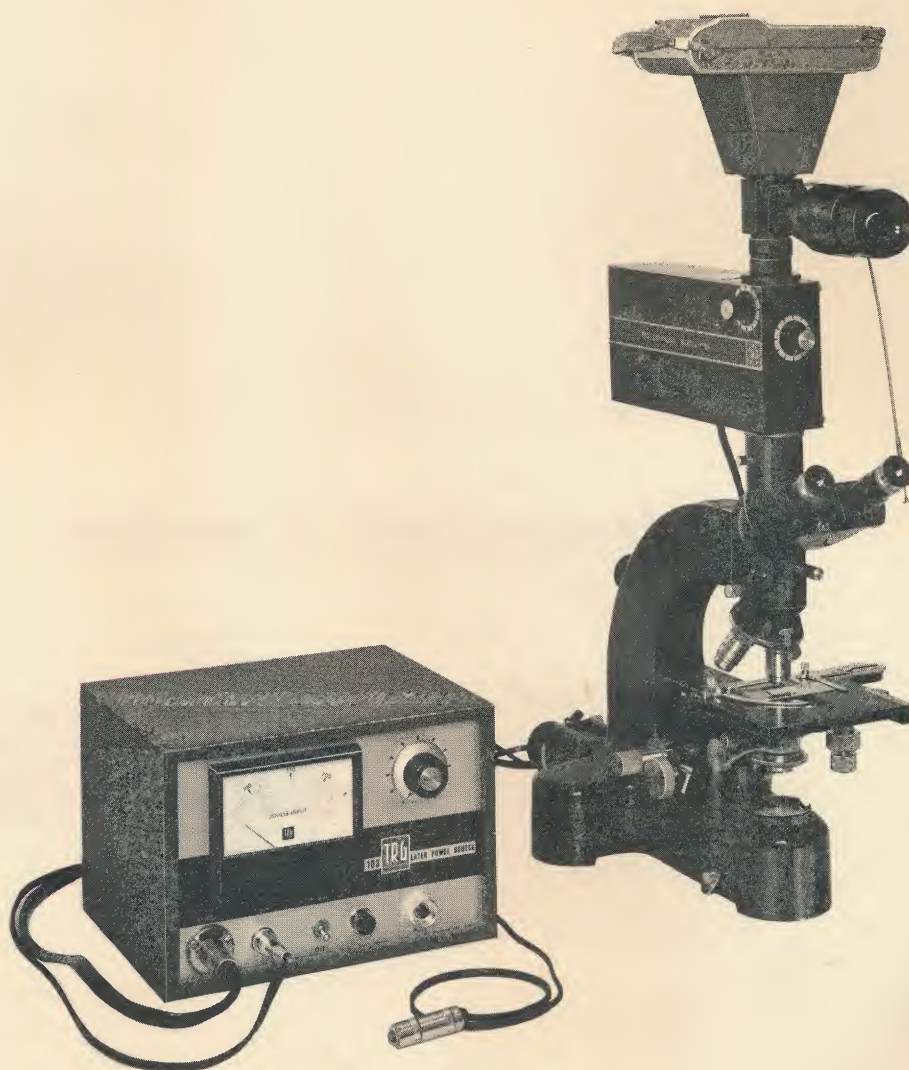
FOR SCIENCE,
INDUSTRY, DEFENSE



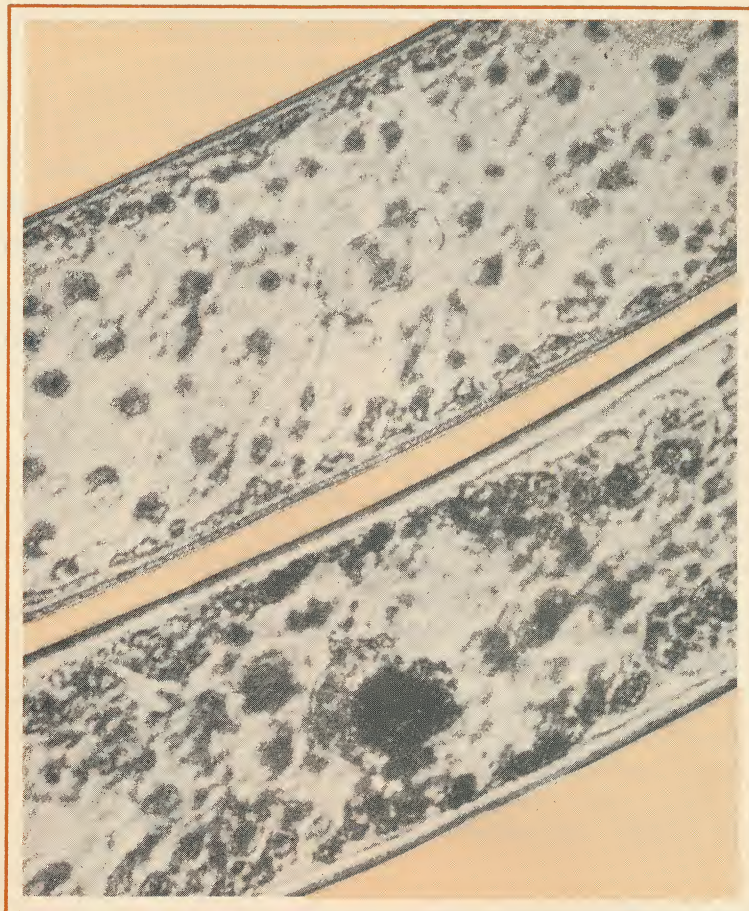
MODEL 513

biolaser system

- ▶ Can be focused to spot sizes as small as one micron.
- ▶ A flux density on stage is provided up to 10^4 joules/cm².
- ▶ Simple x-y controls permit precise spot positioning.
- ▶ Can be triggered remotely or by panel push-button.
- ▶ Permits simultaneous photography and microirradiation of the specimen.
- ▶ Cinemicrography, time-lapse photography, and closed-circuit television techniques can be applied.



Alga cell (Spirogyra) before and after microirradiation of nucleus. (The microirradiation caused no damage to the cell walls.)



The TRG Model 513 Biolaser is a complete, practical, working system for biological and biomedical research using laser techniques. This new instrument contains a controlled high-intensity monochromatic source of energy that produces an ultra-narrow coherent light beam which can be conveniently focused through the microscope to spot sizes as small as ONE micron. The Biolaser is ready to use by simply plugging it into a 115-volt AC outlet without adding auxiliary instrumentation. Researchers now have an easy-to-operate, easy-to-set-up instrument capable of severing cellular bodies with more elegant techniques than those afforded by micromanipulation methods. Adapters are available to permit simultaneous photography and irradiation of the specimen. Cinemicrography, time-lapse photography, and closed-circuit television techniques can be applied to broaden the instrument's capabilities as a research tool.

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The 513 can be used in a wide range of scientific and biomedical applications such as:

- Laser microirradiation of biological specimens.
- Interaction of electromagnetic radiation with biological systems.
- Studies of the molecular level on cellular components and isolated cells.
- Irradiation of blood group substances, enzymes, and plasma proteins.
- Selective destruction or alteration of cell components.
- Irradiation of tissue cultures.
- Microsurgical applications to provide openings in cell walls with much greater accuracy and ease than is possible with micromanipulation.

By means of the simple X-Y controls, the 513 permits precise positioning of the laser beam on the specimen. The laser spot size incident upon the specimen is varied by changing the power of the microscope objectives. The greater the magnification, the smaller the focused spot. Spot size can also be controlled by means of the interchangeable apertures supplied with the unit.

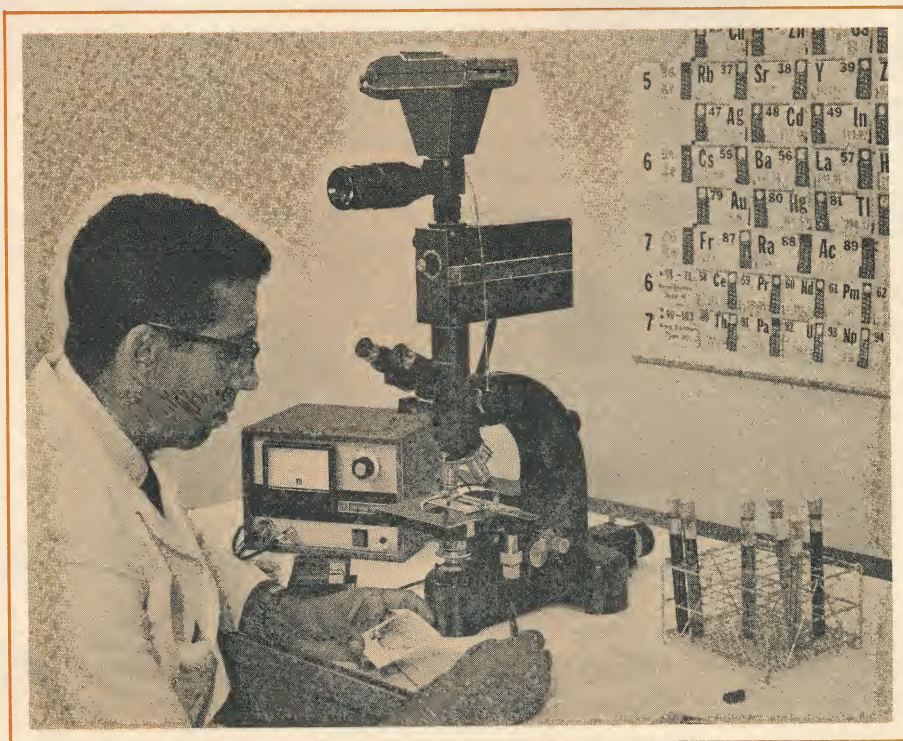
A great number of new experiments have been reported using laser techniques in biological research. Many of these appear to be developing rapidly from theoretical concepts to functional techniques. Your research in biological or biomed-

ical investigations will be advanced by the introduction of the new laser technique. Our representative will welcome the opportunity to discuss your application with you.

Other new possibilities for Biolasers in current research and development are:

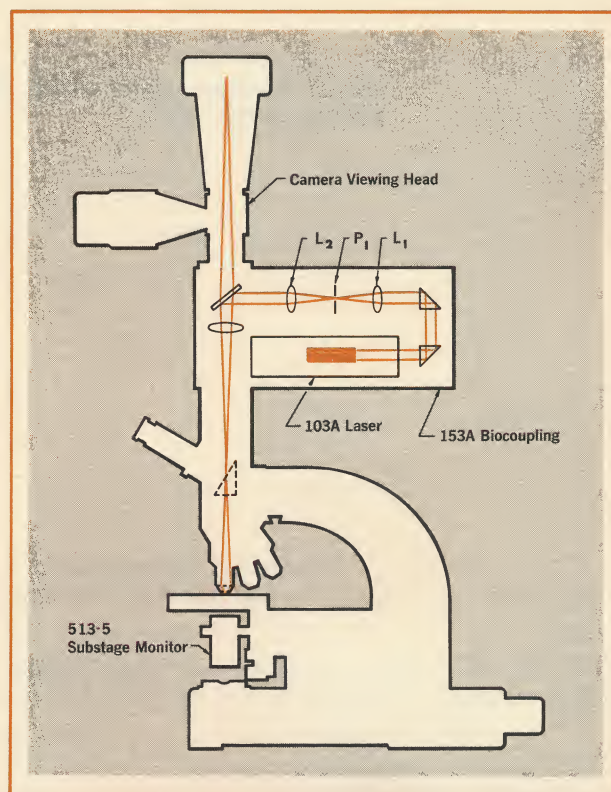
- Micrometallurgical analysis under high magnification.
- Photography of fast-moving organisms.
- Spectroscopic studies of very small regions of biological interest.

applications



description

Functional diagram of Model 513 Biolaser system.



The 513 Biolaser combines a low-power laser system with the optics and easy handling capabilities of a high-quality research microscope. The principles of microscopy apply to the coherent light beam from the laser head as well as the incoherent, transmitted light from the microscope base. The coarse and fine focusing adjustments of the object stage of the microscope automatically focus the laser beam to the primary image plane of the microscope.

The basic system consists of the following units:

- 153A Biocoupling
- 103A Laser Head
- 103A Power Supply
- Leitz Ortholux Microscope — not supplied. (Can be adapted for other microscopes on request.)

The following components are also available as accessories:

- 153A-5 Camera Adapter
- 513-4 Safety Interlock
- 513-5 Substage Energy Monitor
- 102 Energy Meter

The laser is easily coupled to the microscope, without extensive alignment, and is ready for use within a matter of minutes.

BASIC SYSTEM

103A Laser Head The 103A Laser Head is constructed of a rugged, light weight, cast aluminum housing 2 inches in diameter by 6 inches long. The housing contains the ruby laser crystal, flashlamp, focusing cavity, and trigger transformer. An adapter is provided for forced air or gas cooling where repetition rates exceed one per minute.

This rugged and reliable laser head needs no alignment, and its ruby and flashlamp can easily be removed for maintenance; furthermore, maintenance-free operation is obtained for more than 10,000 cycles.

103A Power Supply The 103A Power Supply furnishes the flash-lamp energy for the laser head as well as the flashlamp excitation voltage. The energy is continuously adjustable from 70 to 230 joules using a front panel control. Excitation voltage is produced by activation of the local or remote trigger switch.

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Stage of microscope showing substage monitor for measuring incident energy.

153A Biocoupling The 153A Biocoupling contains the laser head, associated beam-forming optics, and the X-Y controls for coincidence adjustment of the laser spot to the microscope eyepiece reticle.

To produce a beam diameter of 1 micron at the stage of the microscope (see functional diagram of biolaser), the output beam of the laser is focused on a pinhole (P_1) aperture by L_1 . The laser-illuminated pinhole serves as the object for L_2 , which collimates the beam. The beam is reflected into the microscope eyepiece by a multi-layer dielectric-coated beam splitter. The beam splitter reflects a narrow band of the visible spectrum in the region of the laser output (6943\AA) and transmits other wavelengths, thereby permitting simultaneous photography and irradiation of the specimen.

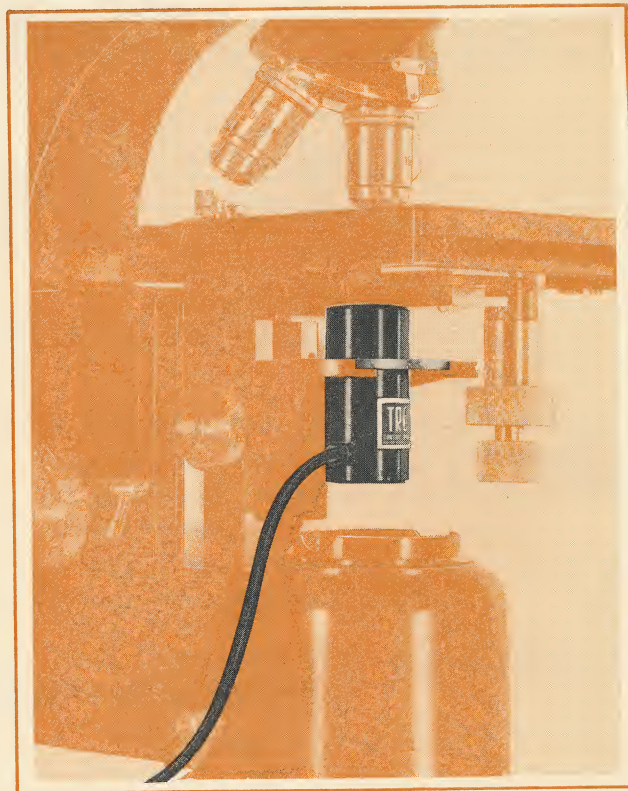
The coupling is supplied with four different aperture sizes which provide a spot size range from 1 to 8 microns when used with a $63\times$ objective. Larger spot sizes can be produced by varying the objective lens or by removing the pinhole aperture.

Precise alignment of the laser spot with the eyepiece reticle is achieved with two simple external dial adjustments which provide X-Y positioning of the laser spot on the stage.

ACCESSORIES

153A-5 Camera Adapter The Model 153A-5 Camera Adapter has been designed specifically for use with the Bausch & Lomb Model N Eyepiece Camera. The adapter contains the necessary optics and a dichroic filter to prevent scattered laser radiation from overexposing the film.

The Model N Eyepiece Camera Viewing Head (Bausch & Lomb No. 42-16-11) can be attached directly to the TRG 153A-5 camera adapter without modification. Other camera adapters are available on special order.



153A-6 Optical Filter Set The Model 153A-6 Filter Set consists of four calibrated optical filters with nominal transmission values of 1%, 6%, 25%, and 50%. The filters are used to attenuate the laser energy by a known value.

513-4 Safety Interlock The Model 513-4 Safety Interlock prevents the laser from firing while the operator is viewing the stage through the binocular eyepiece. The 513-4 attaches directly to the Leitz triocular Phototube No. FSOIYEE-SINE of the Ortholux microscope. The safety interlock is connected to the 103A Power Supply and prevents the laser from firing when the sliding prism is in the binocular viewing position.

513-5 Substage Energy Monitor The Model 513-5 Substage Energy Monitor is used to measure the laser energy in the focused spot at the stage of the microscope. The 513-5 fits directly into the dovetail slide below the stage of the Ortholux microscope and has a typical sensitivity of 200 microvolts per joule.

102 Energy Meter The Model 102 Energy Meter is a precision transistorized microvoltmeter which is internally calibrated to the 513-5 to read the energy input in joules. The Model 102 can be operated from an AC line or from an internal rechargeable battery (optional).

specifications

LASER HEAD

Flux Density on Stage:	Up to 10^4 joules/cm ²
Wavelength:	6943Å
Pulse Length:	150 μ seconds
Repetition Rate	
Uncooled:	1 per minute
Cooled:	1 pulse every 30 seconds
Power Output:	0 to 300 millijoules (nominal)

Power Input: 230 joules (max)

Threshold: 150 joules (nominal)

Effective Beam Diameter: 5 mm

Beam Divergence: 10 milliradians (nominal)

Coating: Multilayer dielectric

POWER SUPPLY

Input Voltage: 115/220 volts ac $\pm 10\%$
50-60 cps, single phase

Trigger: Remote or panel pushbutton

Interconnecting Cables:

- a. Line cord supplied
- b. 6 foot cable and connectors supplied to connect 103A Laser Head to power supply

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